the width of the band gap. It should be noted that a stronger change in the widths of the band gap in comparison with the composition of $As_{40}Se_{60}$ is observed in the composition of $As_{40}Se_{30}Te_{30}$. This different change of band gap apparently due to the fact that the atomic density obtains the highest values in the composition $As_{40}Se_{30}S_{30}$. The results are explained with changes in the degree of disorder and concentration local defects depending on the chemical composition.

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Superimposed equally oriented diffraction gratings formed in As_2S_3 films

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The known chalcogenide amorphous films are suitable materials for formation of composite diffraction structures due to their optical properties and advanced registration parameters. To obtain the multi-beam light diffraction the surface-relief diffraction structures composed of superimposed equally oriented gratings were formed.

Thermally deposited on glass substrates amorphous As_2S_3 films of 1.2 µm thickness were used for producing of diffraction structures. using electron beam recording. Two or three equally oriented diffraction gratings were recorded sequentially at the same location of As_2S_3 film at 23 kV acceleration voltage. In general grating period ranged from 0.8 µm to 4.0 µm. Surface-relief grating structures were formed by chemical etching in KOH water solution. Diffraction efficiencies of gratings were measured in transmission mode at normally incidence of laser beam (λ=0.633 µm). Diffraction patterns produced by various diffraction structures based on superimposed gratings were studied. Each of superimposed gratings produces own set of diffracted beams. For example, the diffraction pattern from structure composed of three superimposed gratings with grating periods of 1.8 µm, 1.9 µm and 2.0 µm is shown. In the case of superimposing of gratings with different grating periods the beating of spatial frequency results in appearance of extra diffracted beams that can be displayed as weak spots in corresponding diffraction pattern. Such beam “hosts” were predicted by modeling of the light diffraction pattern from grating structure using the Angular Spectrum propagation method. It was determined that in the case of optimized conditions of grating structure production the superimposing of gratings resulted in increase of diffraction efficiency of each of superimposed gratings in comparison with one of a single grating..

second order first order zero order

Fig. 1. Diffraction pattern from three superimposed equally oriented gratings with grating periods of 1.8 μm, 1.9 μm and 2.0 μm.

Different surface-relief diffraction structures composed of two or three equally oriented superimposed gratings were formed. Various combinations of diffracted beams were produced by such grating structures.

Effect of amorphous shell on transfer phenomena and optical properties of size-limited systems

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In size-quantized systems (quantum wires, quantum dots), the effect of carrier scattering on surface roughness on kinetic phenomena is especially pronounced with small nanostructures.

If a size-limited system is encased in an amorphous shell (for example, the often studied bismuth nanowire in a glass shell), then it can, in particular, due to deformation processes, significantly affect the surface of the quantum system, that is, randomly affect the size of the nanostructure. The latter circumstance has a significant effect on the kinetic processes occurring in dimensionally quantized structures without and in the presence of a shell. The influence of the shell contributes to a noticeable decrease in electrical conductivity and thermopower in nanostructures.

In an external longitudinal electric field (the electric field intensity is directed perpendicular to the axis of the quantum wire), a significant decrease in mobility with increasing intensity in a quantum system clad in an amorphous shell is possible.

The influence of the shell can manifest itself especially vividly in the case of interband and impurity absorption of an electromagnetic wave, when electrons at the optical transition fall to the bottom of the size-quantized conduction band. It is at the bottom of the quantized zones of

the one-dimensional nanostructure that features appear in the density of electronic states, whose influence on the kinetic phenomena can be consistently described taking into account carrier scattering on a rough surface. Consequently, using various types of shells, one can noticeably affect the physical properties of the nanostructures under study.